

Appl. No. 10/656,185
Amendment dated August 19, 2004
Reply to Office Action of March 19, 2004

REMARKS

Claims 1-17 are pending in this application. For purposes of expedition, claims 1-17 have been amended in several particulars for purposes of clarity and brevity that are unrelated to patentability and prior art rejections in accordance with current Office policy, to further and alternatively define Applicants' disclosed invention and to assist the Examiner to expedite compact prosecution of the instant application.

Claims 4, 7, 8, 13, 16 and 17 have been conditionally allowed if amended to overcome the outstanding rejection under 35 U.S.C. §112, second paragraph, for reasons stated on pages 2-5 of the Office Action (Paper No. 20040303), and rewritten in independent form to include all of the limitations of their respective base claims 1 and 9 and intervening claims 2, 3, 10 and 11. The Examiner's indication of allowability of these claims is noted with appreciation. For purposes of expedition, claims 4, 7, 8, 13, 16 and 17 have been amended to overcome the outstanding objection and outstanding rejection under 35 U.S.C. §112, second paragraph, for reasons stated on pages 2-5 of the Office Action (Paper No. 20040303) and rewritten in independent form to include all limitations of their respective base claims 1 and 9 and intervening claims 2, 3, 10 and 11 in order to place in condition for allowance. As amended, claims 4, 7, 8, 13, 16 and 17 are now deemed in condition for allowance.

The title of the invention has been objected to for failing to be sufficiently descriptive. In response thereto, a new title —SUPERSENSITIVE NUCLEAR MAGNETIC RESONANCE MICRO IMAGING APPARATUS— as requested, is hereby submitted for the Examiner's consideration and entry.

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The drawings have been objected under 37 C.F.R. §1.83(a) for failing to show the "gradient magnetic field coil and a high frequency emitting coil" as identified on page 2 of the Office Action (Paper No. 20040302). Actually, these features are shown in FIG. 6. Specifically, FIG. 6 shows the detail of a detector probe in which the gradient magnetic field coils 19, 20, 21, 22, 23 and 24 and a solenoid detector coil 17 are utilized. The field coils 19, 20, 21, 22, 23 and 24 are 3-axis gradient magnetic field coils used to generate a desired magnetic field gradient in a desired direction for imaging, as described on page 22, lines 4-25 of Applicants' specification. Likewise, the solenoid detector coil 17 is a receiving coil that can also be used as a high frequency emitting coil. In view of the showing of FIG. 6 and the foregoing explanations, Applicants respectfully request that the objection be withdrawn.

Claims 1, 5 and 9 have been objected to because of informalities as kindly listed on pages 2-3 of the Office Action (Paper No. 20040302). The Examiner's comments are noted with appreciation. Claims 1, 5 and 9 have been amended to overcome those instances of ambiguities as identified by the Examiner. With respect to the comment regarding the use of a negative term "not" which the Examiner alleges as unclear, Applicants respectfully submit there is nothing inherently ambiguous about a negative limitation. So long as the boundaries of the patent protection sought are set forth definitely, albeit negatively, the claim complies with the requirements of Section 112, second paragraph. For example, in In re Wakefield, 422 F.2d 897, 164 USPQ 636 (CCPA 1970), a claim recited the limitation "not in excess of 10% 3,4 structure, and essentially no 1,2 structure" in order to exclude the characteristics of the prior art product. The CCPA held that such

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negative terminology was definite because each recited limitation was definite. In view of the foregoing amendments to claims 1, 5 and 9 and the current view of the negative limitation, Applicants respectfully request that the objection be withdrawn.

Claims 1-8 have been rejected under 35 U.S.C. §112, 1st ¶, as failing to provide sufficient information to support the limitation "the spatial resolution in imaging of the biosample is not more than one-tenth of a cell that forms the biosample". While Applicants' specification supports support that limitation, for example, on page 12, the limitation in question has been canceled without prejudice or disclaimer to render the rejection moot.

Claims 1-17 have been rejected under 35 U.S.C. §112, 2d ¶, as being indefinite and incomplete for omitting essential structural cooperative relationships of elements, such as the magnet, gradient coils, receiving coil and sample. For purposes of expedition, base claims 1 and 9 have been amended to set forth the relationship between these elements in order to render the rejection moot.

Claims 1, 3, 5, 6, 9, 11, 12, 14 and 15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Anderson et al., U.S. Patent No. 6,163,154, as modified to incorporate selected features from Anderson, U.S. Patent No. 5,552,709 for reasons stated on pages 5-6 of the Office Action (Paper No. 20040302). However, Applicants submit that key features of Applicants' base claims 1 and 9 are not disclosed or suggested by Anderson '154 and Anderson '709, whether taken individually or in combination with any other references of record. Therefore, Applicants respectfully traverse the rejection and request the Examiner to reconsider and withdraw this rejection for the following reasons.

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First of all, base claims 1 and 9 have been amended to clearly set forth the relationship between the "superconducting magnet", the "gradient magnetic field coil" and the "solenoid type detection antenna" to distinguish over Anderson '154 and Anderson '709. For example, base claim 1, as amended, defines a supersensitive nuclear magnetic resonance (NMR) imaging apparatus comprising:

a sample chamber positioned to receive a biosample for image analysis at a predetermined spatial resolution;

a superconducting magnet formed of laterally divided split magnets, and a gradient magnetic field coil arranged to generate a gradient magnetic field in a horizontal direction for irradiation to the biosample in the sample chamber; and

a solenoid type detection antenna arranged to detect a NMR signal obtained from the sample under irradiation of the gradient magnetic field for image analysis,

wherein the biosample, including at least one of cells, organic tissues, and laboratory small animals, is inserted in the sample chamber of generally 1 to 30 mm in diameter at a center of the gradient magnetic field, from a direction orthogonal to the direction of the magnetic field, and position information is applied to the NMR signal by the gradient magnetic field.

Similarly, base claim 9, as amended, defines a supersensitive nuclear magnetic resonance (NMR) imaging apparatus comprising:

a sample chamber positioned to receive a protein sample for image analysis at a predetermined spatial resolution;

a superconducting magnet formed of laterally divided split magnets, and a gradient magnetic field coil arranged to generate a gradient magnetic field in a horizontal direction for irradiation to the protein sample in the sample chamber; and

a solenoid type detection antenna arranged to detect a NMR signal obtained from the protein sample under irradiation of the gradient magnetic field for image analysis,

wherein the protein sample dissolved into liquid is inserted into a sample tube, and placed in the sample chamber from a direction orthogonal to the direction of the gradient magnetic field, a protein crystal can be grown in the gradient magnetic field, the predetermined spatial resolution is obtained for observation of the surface property of the protein crystal when the protein dissolved in the liquid is crystallized, a growing velocity and a growing surface of the crystal can

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be observed on site by the nuclear magnetic resonance imaging, and crystal growth conditions can be controlled by obtained information.

Key features of Applicants' base claims 1 and 9, including to realize a NMR imaging apparatus with a predetermined resolution, are based on applying the position information to a NMR signals by the gradient magnetic field and realization of high sensitivity by a solenoid type detection antenna.

In contrast to Applicants' base claims 1 and 9, Anderson '154, as a primary reference, only discloses a conventional magnet assembly, as shown in FIG. 3, for use in a small scale NMR apparatus intended to measure the concentration of a compound, such as glucose, in a patient.

According to Anderson '154, the gradient magnetic field coil is related to selection of signal deletion of a solvent, and coherence. This is in contrast to Applicants' claimed "gradient magnetic field coil" in which "position information" is given by performing frequency encoding and phase encoding by a gradient magnetic field. Since position information is not given or described by Anderson '154, imaging cannot be performed.

As a secondary reference, Anderson '709 does not remedy the noted deficiencies of Anderson '154 in order to arrive at Applicants' base claims 1 and 9. This is because Anderson '709 only discloses techniques in which a NMR sample cell can be improved for enhancing sensitivity of an NMR probe. As a result, Anderson '709 does not disclose any use of the "superconducting magnet", the "gradient magnetic field coil" and the "solenoid type detection antenna" in the manner defined by Applicants' base claims 1 and 9.

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In order to establish a *prima facie* case of obviousness under 35 U.S.C. §103, the Examiner must show that the prior art reference (or references when combined) must teach or suggest all the claim limitations, and that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to modify the reference or to combine reference teachings, provided with a reasonable expectation of success, in order to arrive at the Applicants' claimed invention. The requisite motivation must stem from some teaching or suggestion to make the claimed combination must be found in the prior art, and not based on Applicants' disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP 2143. In other words, all the claim limitations must be disclosed or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USQP 494, 496 (CCPA 1970). "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." ACS Hospital System, Inc v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The Examiner must point to something in the prior art that suggests in some way a modification of a particular reference or a combination of references in order to arrive at Applicants' claimed invention. Absent such a showing, the Examiner has improperly used Applicants' disclosure as an instruction book on how to reconstruct to the prior art to arrive at Applicants' claimed invention. Furthermore, any deficiencies in the cited references cannot be remedied

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with conclusions about what is "basic knowledge" or "common knowledge". See In re Lee, 61 USPQ 2d 1430 (Fed. Cir. 2002).

In the present situation, Anderson '154 and Anderson '709 both fail to disclose and suggest key features of Applicants' base claims 1 and 9. Therefore, Applicants respectfully request that the rejection of claims 1, 3, 5, 6, 9, 11, 12, 14 and 15 be withdrawn.

Dependent claims 2 and 10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Anderson et al., U.S. Patent No. 6,163,154, as modified to incorporate selected features from Anderson, U.S. Patent No. 5,552,709 and what the Examiner alleges as "Applicant Admitted Prior Art" for reasons stated on pages 5-6 of the Office Action (Paper No. 20040302). Again, Applicants respectfully traverse this rejection for the same reasons discussed against the rejection of Applicants' base claims 1 and 9.

Lastly, claims 1, 3, 5 and 6 have been provisionally rejected under the judicially created doctrine of obviousness-type double patentable as being unpatentable over claims 1-11 of co-pending application Serial No. 10/099,978 for reasons stated on pages 8-9 of the Office Action (Paper No. 20040302). Similarly, claims 1-8 have been provisionally rejected under the judicially created doctrine of obviousness-type double patentable as being unpatentable over claims 1-12 of co-pending application Serial No. 10/326,085 for reasons stated on page 9 of the Office Action (Paper No. 20040302). While Applicants disagree with the Examiner's assessment of these claims, a terminal disclaimer is enclosed herewith to overcome these rejections and to place all claims in condition for allowance.

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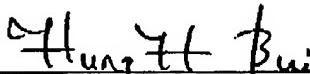
In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney at the Washington DC area office at (703) 312-6600.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage of fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, No. 01-2135 (Application No. 520.42340CX1), and please credit any excess fees to said deposit account.

Respectfully submitted,

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